PATENT SPECIFICATION

Application Date: Sept. 25, 1922. No. 25,859/22. **207,921**

Complete Left: June 21, 1923.

Complete Accepted: Dec. 13, 1923.

PROVISIONAL SPECIFICATION.

Improvements in or relating to Rotary Engines, Pumps and the like.

We, ALBERT WILLIAMS DAW and ZACHARIAS WILLIAMS DAW, of 11, Queen Victoria Street, in the City of London, E.C. 4, Engineers, British subjects, do hereby declare the nature of this invention to be as follows:—

This invention consists of improvements in the rotary engines of the crescent chamber type described in our Patent Specification No. 167,320 of May 17th 1920 and relates to an improved construction of the end closing plate by means of a diaphragm attachment; the employment of a cut-off plate when the engine is driven by steam; and the construction of each main cylinder cover with an extension which serves as a journal, the one extension being provided with a passage, or passages connected with the governing arrangement, and the other extension with a passage, or passages which lead from the main cylinder to the exhaust outlet.

When the ends of the crescent chamber are closed by means of a plate the peripheral surface of which is arranged to slide in contact with the inner peripheral surface of the main cylinder, we ensure a tight joint by means of a flexible annular diaphragm so arranged that it covers the joint made by contact of the peripheral surface of the closing plate with the inner peripheral surface of the main cylinder, the flexible diaphragm being preferably attached to the closing plate by means of another plate, for which purpose its inner part is inserted between the plates which are then bolted together, whilst the outer part of the diaphragm is attached to the main cylinder casing by being fixed between the end of the main cylinder and the cover or other part of the engine to which such end of the main cylinder is attached, but it may be fixed in any other suitable manner to the main cylinder so that a tight joint is obtained. The annular diaphragm is formed with a flexible corrugation where it bears on the main cylinder casing and is preferably arranged as close as possible to the peripheral surface of the closing plate in order that gaseous pressure acting on the diaphragm through leakage will be nearly balanced by its reaction on the closing plate, thus allowing a small amount of sliding movement to the plate to enable it to bear on the end surface of the inner cylinder when subjected to pressure.

In order to relieve pressure on the closing plate when it is employed either with or without the above described flexible diaphragm, we arrange a number of cylinder recesses therein, as described for balancing the pressures on the closing plate in our Patent Specification No. 167,320 of May 17th 1920, above referred to, at the side which is to be relieved of pressure so that such recesses will be open to the atmosphere or to the exhaust; for which purpose a fluid tight filling block is fitted to slide in each recess and attached in any suitable manner to the main cylinder casing, the block and casing being provided with a connected passage through which the recess is placed open to the atmosphere or to the exhaust.

When the engine is to be driven by steam and the main cylinder is arranged to rotate, we construct the main end cylinder cover at the steam supply end with an extension which is a hollow journal for the main shaft, the journal being so arranged that the steam will pass into a steam chest formed within a fixed casing at the outer end of the journal, such casing forming part of the casing surrounding the main cylinder.

[*Price* 1/-]

Then after entering the said steam chest the steam flows through a series of holes, or passages in the structure of the hollow journal and thence into a chamber in the main cylinder cover in which an annular plate is carried on the main shaft so that it can slide thereon but not rotate, and having a suitable opening to admit the steam to the crescent chamber through a passage in the main cylinder cover such opening serving to cut off the delivery of steam at a predetermined point in each revolution of the engine, the chamber in the main cylinder cover being formed by means of a separate plate fixed therein between the end of the main cylinder and the main cylinder cover, whilst a packing gland is arranged between the said steam chest and the chamber carrying the cut-off plate, and also between the said steam chest and the outside bearing.

The exhaust from the engine is through the other main cylinder cover where there is also a hollow journal forming an extension of an end plate of the cylinder cover which is fixed between the end of the main cylinder and the main cylinder cover so that it must rotate therewith whilst the cylinder cover is also provided with another extension which surrounds the journal so that a passage is formed for the exhaust, fluid tightness being ensured by means of a packing gland between the exhaust outlet and the chamber formed by the fixed casing surrounding the main cylinder and by means of a packing gland, or the bearing, between the exhaust outlet and the atmosphere.

In the construction of the barrage vanes described in our said prior patent specification with an oscillatory part carrying flanges engaging corresponding grooves in a rectangular bearing which is arranged to have radial movement, we adapt a spring or springs to maintain the oscillatory parts in a definite position when it is not in contact, each spring being arranged for this purpose so that it connects the said rectangular part of the barrage vane with one of the flanges of the oscillatory part, such springs being preferably of circular section. The flanges in this case are preferably made of dove-tail section.

When two systems of the engine are employed as a compound steam engine and have an intermediate receiver interposed between them on the same shaft, to enable water collecting in the receiver to escape when the cylinders of the engine rotate, we arrange one or more piston valves in the periphery of the receiver so that each is operated by a rod from one end of the engine for which purpose a slidable sleeve is arranged to rotate with the journal forming the extension of the cylinder cover, the sleeve being operated by means of a forked lever engaging a circular recess in the sleeve or in any other suitable manner from a stationary part of the engine. As the piston valve is subjected to centrifugal action it is preferably arranged parallel to the axis of the main shaft in which position a portion of its length is recessed so that it may be opened to a port hole arranged radially to the axis of the engine for the escape of the water.

Dated the 25th day of September, 1922.

ALBERT WILLIAMS DAW.
ZACHARIAS WILLIAMS DAW.

COMPLETE SPECIFICATION.

Improvements in or relating to Rotary Engines, Pumps and the like.

We, ALBERT WILLIAMS DAW and ZACHARIAS WILLIAMS DAW, of 11, Queen Victoria Street, in the City of London, E.C. 4, Engineers, British subjects, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention consists of improvements in rotary engines of the crescent chamber type described in our prior Patent Specification No. 167,320 and relates to an improved construction of the closing plate by the use of a diaphragm attachment; the employment of a cut-off plate when the engine is driven by steam; and the construction of each main cylinder cover with an extension which serves as a journal, the one extension being provided with a passage, or passages, connected with the supply, and the other extension with a passage, or passages, which lead from the main cylinder to the exhaust outlet.

The improvements are illustrated in the accompanying drawings in which:—

Fig. 1 is a longitudinal section through a compound engine system.

Fig. 2 is a transverse section through

the inner and outer cylinders when two yoke vanes are employed.

Fig. 3 is an end view of a barrage vane.

Fig. 4 is a section on line A.A. of Fig. 3.

Fig. 5 is a section on line B.B. of Fig. 3.

Fig. 6 is a section on line B.B. of Fig. 3 showing a forked form of spring.

In these drawings 1 and 1^a are the main or outer cylinders, 2 the outer cylinder high pressure end cover, and 2^a the low pressure end cover, provided with journals or hollow gudgeons integral therewith, or attached thereto and containing corresponding cylindrical spaces to receive the enlargements of the main shaft; 3 and 3^a the inner cylinders mounted eccentrically in the main or outer cylinders so as to form the crescent shaped chambers 7 and 7^a; and 4 and 4^a the oscillatory and rectangular bearing parts of a series of barrage vanes mounted in the inner cylinders so that they have limited radial and oscillatory movements for the formation of a barrage by their projections successively making contact with the opposite peripheral surface in the narrow part of the crescent shaped chamber between the cylinders, or drums, 1 and 3, and 1^a and 3^a.

When the ends of the crescent shaped chambers 7 & 7^a are closed by means of the plates 13 and 13^a, the peripheral surface of each of which is arranged to slide in contact with the inner peripheral surface of the main cylinder 1 or 1^a, we ensure a tight joint by means of a flexible annular diaphragm 5 or 5^a so arranged that it covers the joint made by contact of the peripheral surface of the closing plate with the inner peripheral surface of the main cylinder; the flexible diaphragm being preferably attached to the closing plate 13 or 13^a by means of another plate 6 or 6^a, for which purpose its inner part is inserted between the plates which are then bolted together, whilst the outer part of the diaphragm is preferably attached to the main cylinder casing by being fixed between the end of the outer cylinder and the cover or other part of the engine to which such end of the outer cylinder is attached, but it may be fixed in any other suitable manner to the outer cylinder to obtain a tight joint. The annular diaphragm 5 or 5^a is formed with a corrugation 8 or 8^a to render it more flexible where it bears on the main cylinder, and is preferably arranged as close as possible to the peripheral surface of the closing plate in order that gaseous pressure acting on the diaphragm through leakage will be nearly balanced by its reaction on the closing plate, thus allowing a small amount of sliding movement to the plate to enable it to bear on the end surface of the inner cylinder when subjected to pressure.

In order to relieve pressure on the closing plate when it is employed with or without the above described flexible diaphragm, we arrange a number of cylindrical recesses 14 therein as described for balancing the pressures on the closing plate in our Patent Specification No. 167,320 above referred to, at the side which is to be relieved of pressure so that such recesses will be open to the atmosphere or to the exhaust; for which purpose a fluid tight filling block 15 is fitted to slide in each recess, and attached in any suitable manner to the main cylinder casing 16, the block and casing being provided with a connected passage 17 through which the recess is placed open to the atmosphere or to the exhaust.

When the engine is to be driven by steam and the main cylinder is arranged to rotate, we construct the main high pressure cylinder 1 and its cover 2 at the steam supply end with an extension 18 which is a hollow journal for the main shaft, the journal 18 and fixed casing 20 being so arranged that the steam will pass into a steam chest 19 at the outer end of the journal, the casing 20 forming part of the casing 21 surrounding the main cylinders. Then, after entering the steam chest 19, the steam flows through a series of longitudinal holes or passages 22 in the structure of the hollow journal 18, and thence into a chamber 23 in the main cylinder cover 2 in which an annular cut-off plate 24 is carried on the main shaft so that it can slide thereon but not rotate when the shaft is stationary, the cut-off plate having a suitable opening 24^a to admit the steam to the crescent chamber 7 through a passage 25^a in the main cylinder cover, such opening serving to cut off the delivery of steam at a predetermined point in each revolution of the engine. The chamber 23 in the main cylinder cover is formed by means of a separate plate 25 fixed between the end of the main cylinder and the main cylinder cover of which it forms part, whilst a packing gland 26 is arranged between the steam chest 19 and the chamber 23 carrying the cut-off plate 24, for the purpose of preventing escape of steam from the steam chest 19, and a packing gland 27 is also arranged between the steam chest and the outside bearing 28.

The exhaust from the engine is through the low pressure, main cylinder cover 2^a where there is a hollow journal 18^a forming an extension of an end cover plate 29 which is fixed between the end of the main cylinder 1^a and the main cylinder cover 2^a of which it forms part, the cylinder cover 2^a being provided with another extension 30 which surrounds the journal so that a passage 31 is formed for the exhaust, fluid tightness being ensured by means of the packing gland 32 between the exhaust outlet 33 and the chamber 34 formed by the fixed casing 21 which surrounds the main cylinders 1 and 1^a, and by means of the packing gland or bearing 35 situated between the exhaust outlet and the atmosphere.

When, as in Fig. 1, two engine units are employed as a compound steam engine with an intermediate receiver 39 interposed between them on the same shaft, we may arrange one or more piston, or slide valves, 40 and 40^a in the peripheral casing of the receiver so that each is operated by a rod 41 or 41^a from one end of the engine, for which purpose a slidable sleeve 42 is arranged to rotate with the journal 18 forming the extension of the cylinder cover 2, the sleeve being operated by means of a forked lever 43 engaging a circular recess 44 in the sleeve or in any other suitable manner from a stationary part of the engine. As, when the system rotates, the piston or slide valve 40 and 40^a is subjected to centrifugal action, the valve is preferably arranged parallel to the axis of the main shaft in which position a portion of its length is preferably recessed so that it may be opened to a port hole 45 or 45^a arranged radially to the axis of the engine for the escape of condensed steam.

In the construction of the barrage vanes when these have as described in the patent specification above referred to, an oscillatory part 4 provided with flanges to engage corresponding grooves in a rectangular bearing part 4^a, which is arranged to have radial movement, we adapt a spring 46 or 46^a at each end to maintain the oscillatory part in a definite position when it is not in contact with the peripheral surface of the cylinder, each spring being arranged for this purpose so that it connects the said rectangular part 4^a of the barrage vane with one of the flanges 47 of the oscillatory part. For the fitting of the spring the flange 47 is advantageously made of dovetail section and the spring either as shown in Figs. 3, 4, 5 and 6, or of any other suitable design.

In the above arrangements it has been assumed that the cylinders rotate and that the shaft is stationary, but the outer cylinder may be stationary and the shaft rotate.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In a rotary engine of the crescent shaped chamber type in which two cylinders are connected together so that the action of the one is controlled by the other, the construction of the main cylinder cover at the supply end for steam (or gases) with an extension which is a hollow journal provided with longitudinal passages in its structure for the steam or gases to pass from a supply chamber arranged at the end of the hollow journal into a chamber in the cylinder cover where an annular cut-off plate is carried substantially as described with reference to the accompanying drawings.

2. In a rotary engine of the crescent shaped chamber type, in which two cylinders are connected together so that the action of the one is controlled by the other, and in which the construction of the main cylinder cover at the supply end is as in Claim 1, the arrangement of a packing gland so that it is situated between the supply chamber and the chamber carrying the cut-off plate in conjunction with another packing gland which is situated between the outside bearing and the supply chamber, substantially as described with reference to the accompanying drawings.

3. In a rotary engine as in Claim 1, the employment of a hollow journal that is an extension of an end plate fixed at the exhaust end of the main cylinder to the main cylinder cover so that a passage for the exhaust is formed outside the journal between the journal and an extension of the main cylinder cover, substantially as described with reference to the accompanying drawings.

4. In a rotary engine as in Claim 3, the arrangement of a packing gland between the exhaust outlet and a chamber formed by a fixed casing surrounding the main cylinder, in conjunction with another packing gland between the exhaust outlet and the atmosphere, substantially as described with reference to the accompanying drawings.

5. In a rotary engine, as in Claim 1, and having two units compounded with an intermediate receiver interposed between them, the arrangement of a piston or slide valve in the peripheral

casing of the receiver operated by a rod from one end of the engine by means of a slidable sleeve on one of the main cylinder journals, substantially as described with reference to the accompanying drawings.

6. In a rotary engine, as in Claim 1, the employment of an annular closing plate having a number of cylindrical recesses formed therein, each of which carries a fluid tight filling block connected to the main cylinder so that a passage may be carried from the recess to the atmosphere, or to the exhaust, to relieve pressure on the closing plate, substantially as described with reference to the accompanying drawings.

7. In a rotary engine, as in Claim 6, the employment of a flexible annular diaphragm attached to the closing plate for the purpose of ensuring a tight joint, substantially as described with reference to the accompanying drawings.

Dated the 21st day of June, 1923.

ALBERT WILLIAMS DAW.
ZACHARIAS WILLIAMS DAW.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1923.

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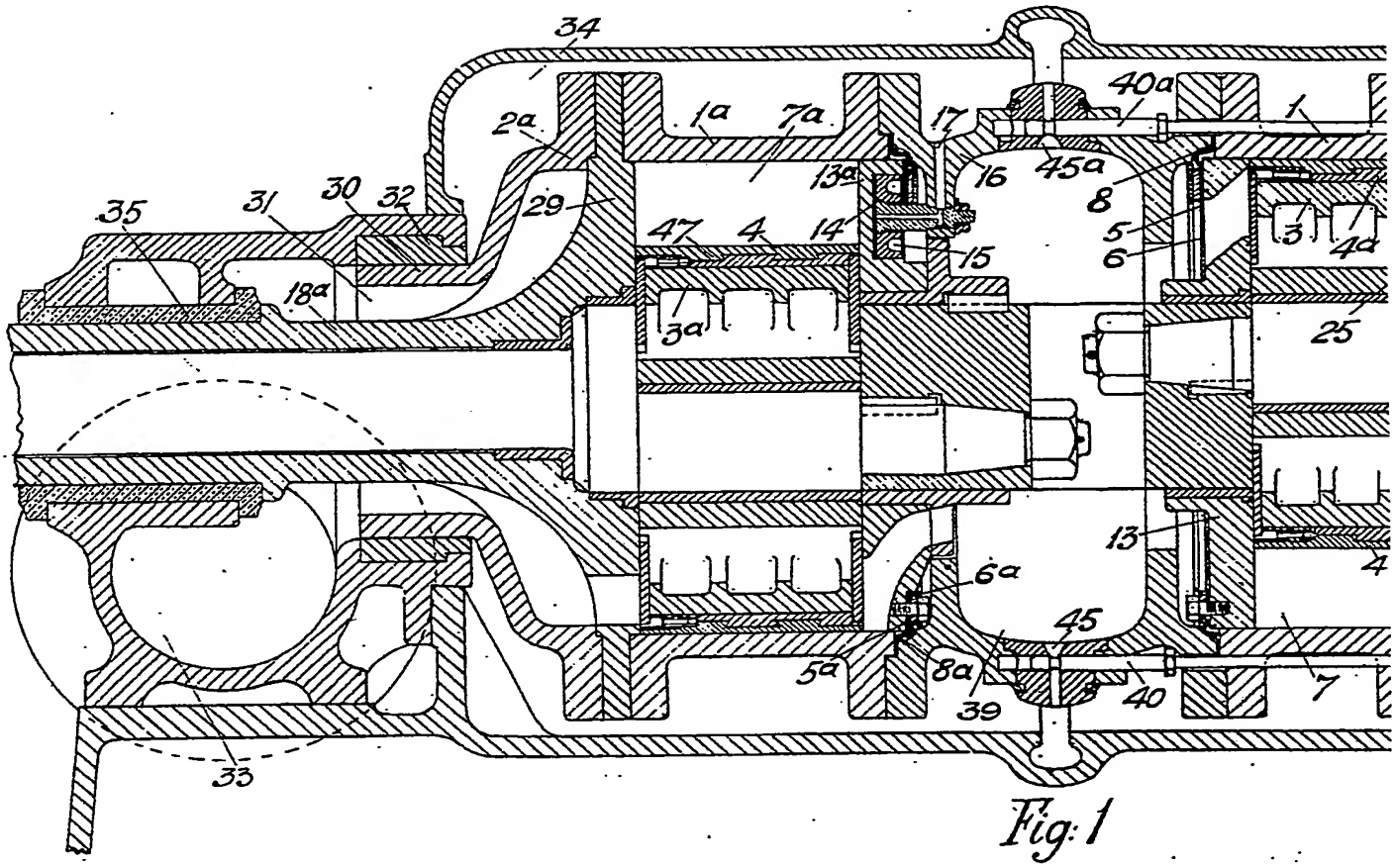


Fig: 1

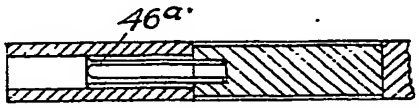
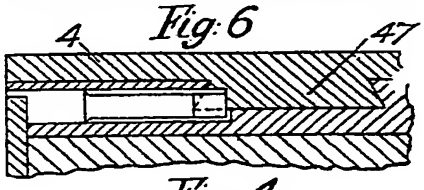


Fig: 6



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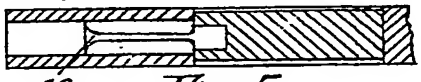


Fig: 5

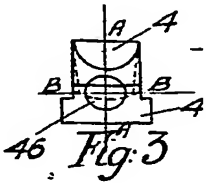


Fig: 3

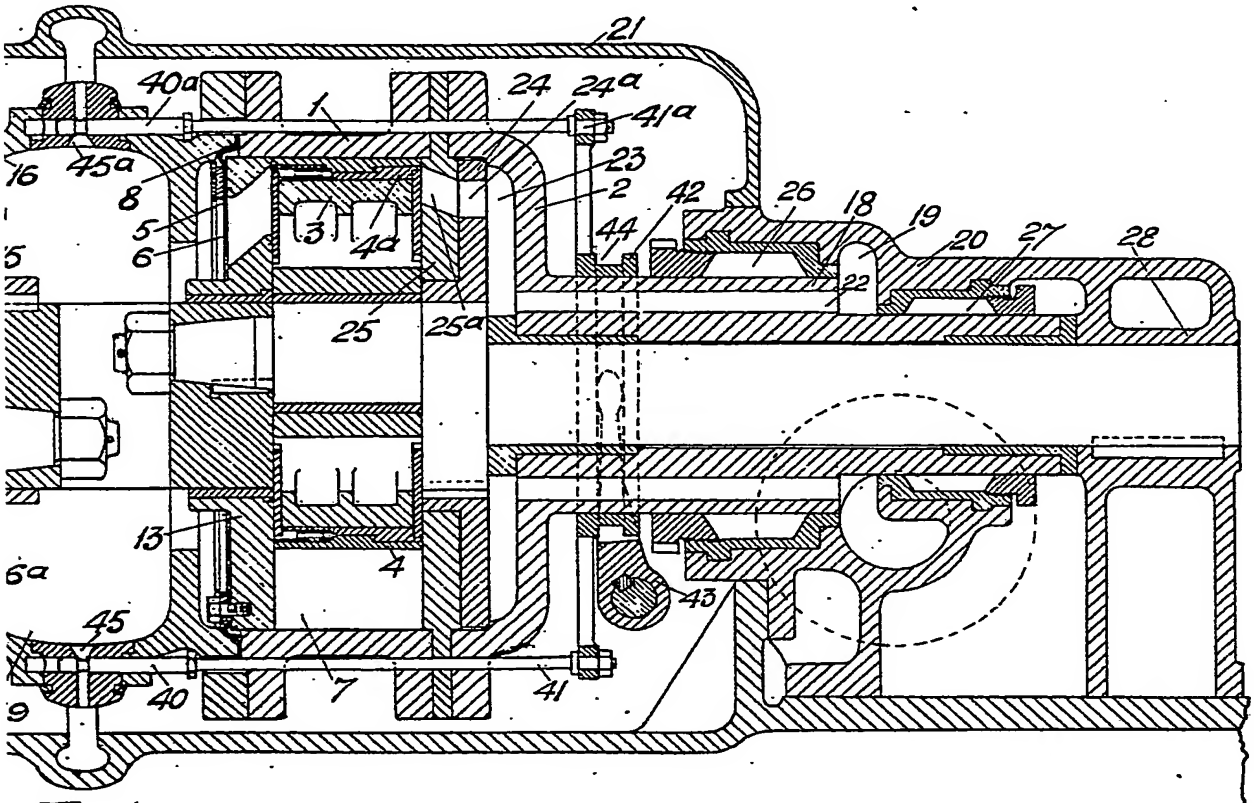
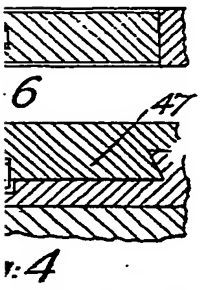


Fig: 1



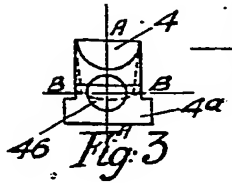


Fig: 3

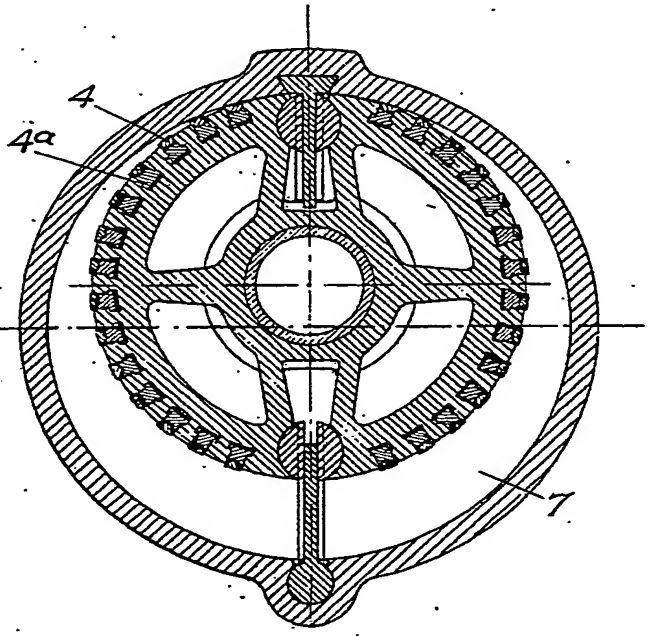


Fig: 2

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[This Drawing is a reproduction of the Original on a reduced scale]

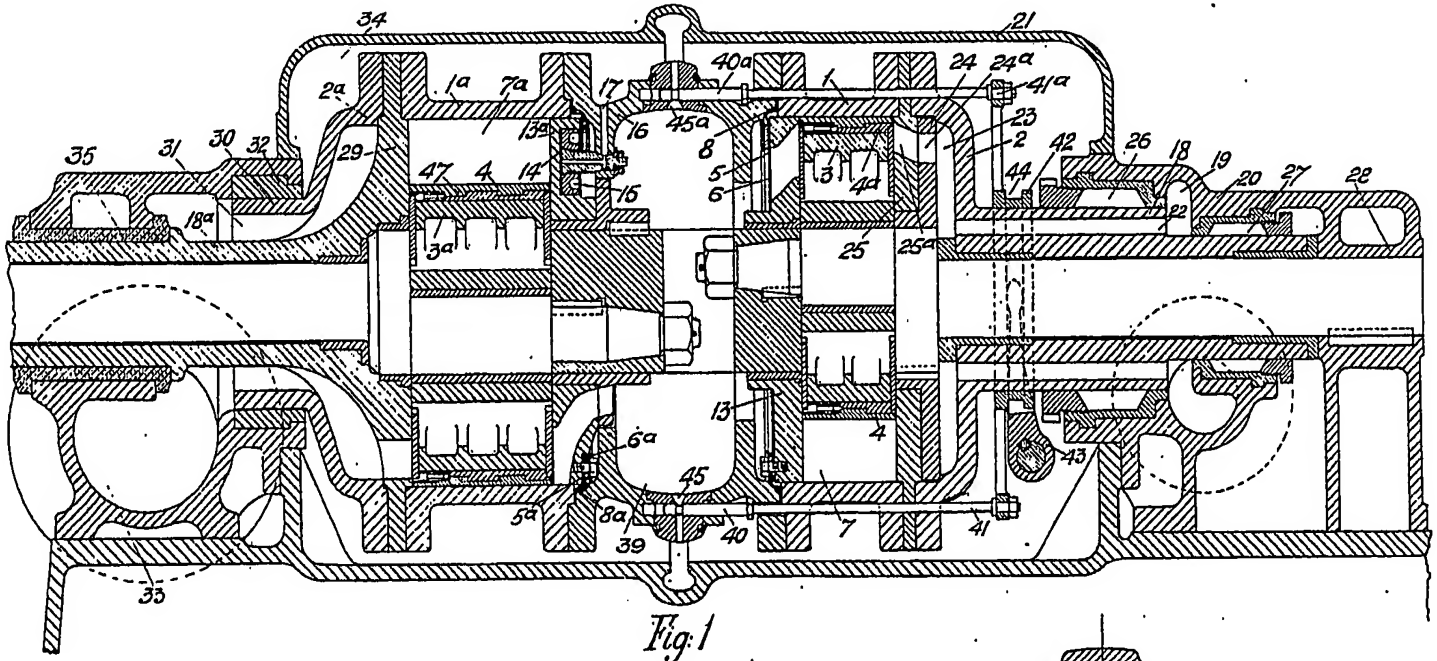

Fig: 1

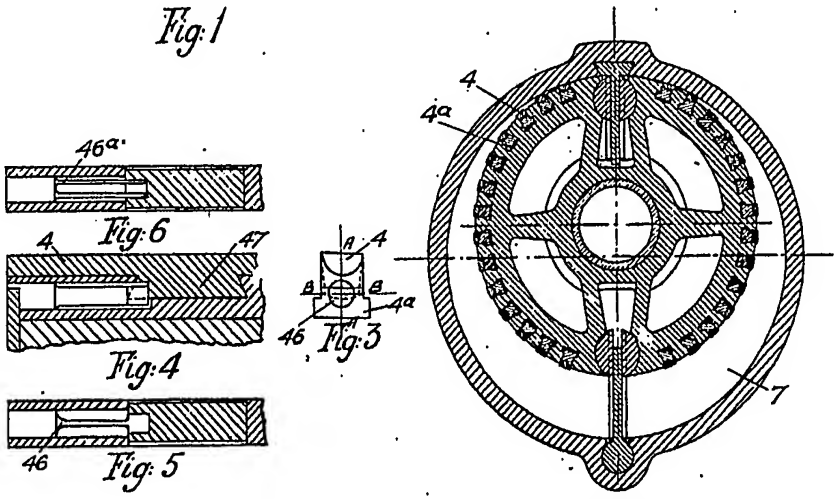

Fig: 2

Fig: 6

Fig: 4

Fig: 5

Fig: 3

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